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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
REDDING, THOMAS M	
ART UNIT	PAPER NUMBER
2624	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/543,183	WILSON ET AL.	
	Examiner	Art Unit	
	THOMAS M. REDDING	2624	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-57* is/are pending in the application.

4a) Of the above claim(s) *10-28 and 33-57* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-9 and 29-32* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *7/22/2005* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *3/15/2006*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

No reply has been received to the Notice of Non-Compliant Amendment mailed on 8/3/2007. As the time for response has expired, the preliminary amendment has not been entered and only the claims in the original application will be examined in this action.

Drawings

1. The drawings are objected to because drawings 2-5 are missing. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the

applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Objections

2. Claims 10 – 28 and 33—57 are objected to under 37 CFR 1.75(c) as being in improper form because a multiple dependent claim cannot depend from any other multiple dependent claim. See MPEP § 608.01(n). Accordingly, the claims have not been further treated on the merits.

Double Patenting

3. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

4. Claims 1-8/1 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-8 of copending Application No. 11/282,811 in view of Pentland et al. "Simple range camera based on focal error".

Regarding claim 1 in the instant application, claim 1 of the conflicting application 11/282,811 does not disclose "the object being placed such that different parts of it are at different distances from the focal plane".

Pentland does teach an "object being placed such that different parts of it are at different distances from the focal plane" (Pentland, figure 9(b), shows the result of measuring an object that has different parts at different distances from the focal plane).

It would have been obvious to one of ordinary skill at the time the invention was made that any object short of a plane object parallel to the focal plane would have different parts of the object at different distances from the focal plane.

Regarding claims 2-8/1 that depend from claim 1 described above, the claims in the instant application are duplicates of the corresponding claims in 11/282,811 and are therefore also obvious.

This is a provisional obviousness-type double patenting rejection.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1 are rejected under 35 U.S.C. 102(b) as being anticipated by Pentland et al. "Simple range cameras based on focal error".

6. Regarding claims 1-3, 6, 8, 29, 30 and 32, Pentland discloses a simple range camera comprising:

illuminating the object with a periodic pattern of light from an illuminating arrangement (Page 2925, Introduction, paragraph 6);

the illuminating arrangement being such that the pattern is in focus in a focal plane and defocuses progressively away from said focal plane (Page 2925, Introduction, paragraph 6);

the object being placed such that different parts of it are at different distances from the focal plane (Page 2931, Results, figure 9(b), shows the result of measuring an object that has different parts at different distances from the focal plane);

capturing image data from the thus-illuminated object (Page 2925, Introduction, paragraph 6);

analysing the captured image data to extract depth information based on the extent of defocussing of the pattern (Page 2925, Introduction, paragraph 6); and

displaying an image of the object without the pattern and with depth information (Figure 10(c), Page 2932).

Further regarding claim 29, Pentland discloses an imaging apparatus comprising:

An illuminating arrangement (figure 6A, projector),

An object (figure 6A, object),

Image data capturing means (figure 6A, camera),

Data analysis means ("The system is implemented entirely in software and, with a Sun Sparcstation 1, runs on a 256 X 256 image in approximately1 s", Pentland, page 2931),

And an image display means (Pentland, page 2931, the Sun Sparcstation 1 would typically have a display).

Regarding claims 2 and 30, Pentland discloses the image is a mask image (Page 2925, Introduction, paragraph 6, Pentland takes an image of a mask pattern projected onto the object).

Regarding claim 3, Pentland discloses the captured image data are captured in a single image (Pentland, Page 2929, Active Depth from Defocus, paragraph 3).

Regarding claim 6, Pentland discloses the image is a 3D image (Page 2925, Introduction, paragraph 1).

Regarding claim 8, Pentland discloses [a] method according to any one of claims 1 to 7, in which the object is placed such that it does not intersect the focal plane (page 2926, figure 2).

Regarding claim 32, Pentland discloses the image data capturing means comprise a two dimensional array of detectors ("In our implementation 7 a standard slide projector is used as the structured light source and a video camera is used to record the blurred light patterns", Pentland page 2929, Active Depth From Defocus, paragraph 1 and "The system is implemented entirely in software and, with a Sun Sparcstation 1, runs on a 256 X 256 image in approximately1 s", Pentland, page 2931).

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

8. Claims 4, 5 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pentland et al. "Simple range cameras based on focal error" in combination with Hori (US 5,608,529).

Regarding claim 4, Pentland discloses all the elements of claim 1 as given above.

Pentland does not disclose the image is an angular-composite image.

Hori, working the in the same field of endeavor of 3D Measurement does teach an image is an angular-composite image ("Thus the patterned images, projected in superimposed manner on the surface of the specimen 7, can be observed from two angles", Hori, Column 9, line 14).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to combine the angle composite imaging method of Hori with the 3D imaging system of Pentland since even an extremely irregular area can be observed by the different views and a high precision achievable with an averaging of the images (Hori, column 9, lines 16-20 and Lines 39-44).

Regarding claim 5, the combination of Pentland and Hori teaches all the elements of claim 4 as given above.

The combination of Pentland and Hori as given does not teach the image data are captured in at least two mask images differing in the angular orientation of the object about a single axis orthogonal to a line between the object and the illuminating arrangement.

Hori does further teach the image data are captured in at least two mask images differing in the angular orientation of the object about a single axis orthogonal to a line between the object and the illuminating arrangement ("Thus the patterned images, projected in superimposed manner on the surface of the specimen 7, can be observed from two angles", Hori, Column 9, lines 11-12 and 14-15, and figure 7A).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to combine the angle composite imaging method of Hori with the 3D imaging system of Pentland since even an extremely irregular area can be observed by the different views and a high precision achievable with an averaging of the images (Hori, column 9, lines 16-20 and Lines 39-44).

Regarding claim 7, the combination of Pentland teaches all the elements in common with claim 6 as given above.

Pentland does not teach the image data are captured in at least three mask images differing in the angular orientation of the object about at least two axes orthogonal to a line joining the object and the illuminating arrangement.

Hori, working in the same field of endeavor of 3D imaging does teach the image data are captured in at least three mask images differing in the angular orientation of the object about at least two axes orthogonal to a line joining the object and the illuminating arrangement ("Thus the patterned images, projected in superimposed manner on the surface of the specimen 7, can be observed from two angles", Hori, column 9, line 14 and "The number of observation optical systems is not limited to two, but there can be employed a larger number of observation optical systems", column 9, line 24).

It would have been obvious at the time the invention was made for one of ordinary skill in the art to use multiple mask images since even an extremely irregular area can be observed by the different views and a high precision achievable with an averaging of the images (Hori, column 9, lines 16-20 and Lines 39-44). The choice of using specifically three mask images, is simply a matter of design choice suggested by the reference (column 9, lines 23-25).

9. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Pentland et al. "Simple range cameras based on focal error" in combination with Nayar et al. (US 6, 229,913).

Regarding claim 9, Pentland teaches all the elements that are common with claim 8.

Pentland does not expressly disclose the object is placed such that it is in a region in which rate of change of defocusing with distance from the illuminating arrangement is greatest.

Nayar working in the same field of endeavor of 3D measurement does teach the object is placed such that it is in a region in which rate of change of defocusing with distance from the illuminating arrangement is greatest ("Preferably, the preselected illumination pattern is optimized so that a small variation in the degree of defocus results in a large variation in the measured relative blur", Nayar, column 4, line 17).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to apply the teaching to optimize the system sensitivity to defocus as taught by Nayar, to the 3D imaging system of Pentland to maximize the sensitivity and robustness of the focus measure function" (Nayar, column 8, line 36, any optimization of the system will generally be to improve system performance).

10. Claim 31 is rejected under 35 U.S.C. 103(a) as being unpatentable over Pentland et al. "Simple range cameras based on focal error" in combination with Freifeld (US 6,724,489).

Regarding claim 31, Pentland teaches all the elements of claim 29 and 30 as given above.

Pentland does not teach the image data capturing means comprise a one-dimensional array of detectors.

Freifeld working in the same field of endeavor of 3D measuring devices does teach the image data capturing means comprise a one-dimensional array of detectors ("In a preferred embodiment, the sensor 20 is formed from a series of linear arrays of pixel detectors with each linear array functioning as an individual line scan camera, such as those manufactured by Dalsa of Waterloo, Canada", Freifeld, column 5, line 52).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to use the linear array detector method of Freifeld with the 3D imaging system of Pentland since "A series of linear array cameras is preferred due to faster image collection speed and higher resolution when compared to area cameras that are employed in prior art methods described above" (Freifeld, column 5, line 55).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to THOMAS M. REDDING whose telephone number is (571)270-1579. The examiner can normally be reached on Mon - Fri 7:30 am - 5:00 pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Vikkram Bali can be reached on (571) 272-7415. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/T. M. R./
Examiner, Art Unit 2624

/Vikkram Bali/
Supervisory Patent Examiner, Art Unit 2624